



**CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004**

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**SECTION A. General description of project activity****A.1 Title of the project activity:**

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Hebei Shangyi Manjing East Windfarm Project

PDD version 2.3

Date of document: 27 Nov 2006

A.2. Description of the project activity:

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The objective of the Shangyi Manjing East Windfarm Project is to generate renewable electricity using wind power resources and to sell the generated output to the North China Power Grid (NCPG) on the basis of a power purchase agreement (PPA). The project activity will generate greenhouse gas (GHG) emission reductions by avoiding CO₂ emissions from electricity generation by fossil fuel power plants that is supplied to North China Power Grid.

The place of the proposed project has an abundant wind resource. A decision has been made to install a total of 33 wind turbines, each with a power output of 1500 kW. The total power capacity of the Windfarm will be 49.5 MW. The expected net supplied power to the grid is 116,820MWh per year.

The project will assist China in stimulating and accelerating the commercialisation of grid-connected renewable energy technologies and markets which is an important objective of the Chinese government. The project will therefore help reduce GHG emissions versus the high-growth, coal-dominated business-as-usual scenario. Furthermore, the project will improve air quality and local livelihoods and promote sustainable renewable energy industry development. The specific goals of the project are to:

- generate electricity;
- reduce greenhouse gas emissions in China compared to a business-as-usual scenario;
- help to stimulate the growth of the wind power industry in China;
- create local employment opportunity during the assembly and installation of wind turbines, and for operation of the windfarm;
- reduce other pollutants resulting from the power generation industry, compared to a business-as-usual approach, such as SO₂ and soot.

A.3. Project participants:

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Name of Party involved (*)(host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R. China (host)	Guohua (Hebei) Renewable Energy Co., Ltd.	No



United Kingdom of Great Britain and Northern Ireland	Carbon Resource Management Ltd	No
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Please see Annex 1 for detailed contact information.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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People’s Republic of China

A.4.1.2. Region/State/Province etc.:

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Hebei Province

A.4.1.3. City/Town/Community etc:

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Shangyi County, Zhangjiakou City.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

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The project is located in Shangyi County, which is in the Northwest of Hebei Province in the People’s Republic of China. Shangyi County lies in about 116 kilometres from Zhangjiakou City. The Shangyi Manjing East Windfarm is located in the east of Shangyi County. It is located at longitude 114°15’ East and latitude 41°11’ North. The altitude of the site ranges from 1550m to 1650m above mean sea level. Figure 1 shows the location of the project.



Figure 1 Map showing the location of the Project.

A.4.2. Category(ies) of project activity:

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Using the approved consolidated methodology ACM0002 the category of the project activity is:

- Sectoral scope 1: Energy industries

A.4.3. Technology to be employed by the project activity:

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The 1500kW GE turbines (1.5s) were selected through competitive bidding. The technology used for the project is transferred from a developed country. The wind turbines are more advanced than the current available Chinese wind turbine technology and the technology is deemed to reflect current good practice.



During the warranty term, there will be on-the-job-training provided by the manufacturer for staff of the Guohua (Hebei) Renewable Energy Company. It is planned that the windfarm will be operational for a minimum of 21 years.

The total supplied power to the grid is expected to be 116,820MWh. The electricity generated from the project will be transmitted to Zhangbei substation of North China Power Grid via a 110kV transmission line. A 50MVA transformer (110kV/35kV) and one 40km 110kV transmission line from Shangyi to Zhangbei will be installed.

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

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The project activity mainly reduces carbon dioxide (CO₂) by substituting fossil fuel generated electricity. Electricity generation in the North China Power Grid is dominated by coal fired power plants.

The emission reductions would not occur in the absence of the proposed activity and the project is additional and therefore not the baseline scenario, because:

- 1) The project faces barriers as the costs per kW installed for the windfarm are higher than the typical fossil fuel fired power stations, which are being considered for the North China Power Grid.
- 2) Wind power provided about 0.13% of the total installed capacity of the North China Power Grid in 2004¹.

A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:

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Applying the proposed methodology to the Shangyi Manjing East Windfarm Project, operating in the North China Power Grid, the project will achieve an ex-ante estimated average annual emission reduction of 120,208 tCO₂/year and 841,456 tCO₂ over the first seven-year crediting period of the project (see Table 1).

Table 1 Estimated emission reductions of Shangyi Manjing East Windfarm Project

Period*	Estimated emission reductions (tCO ₂ e)
2007-2008	120,208
2008-2009	120,208
2009-2010	120,208
2010-2011	120,208
2011-2012	120,208
2012-2013	120,208
2013-2014	120,208
Total estimated reductions in the first	841,456

¹ China Electric Power Yearbook (2005), Page 275.



7-year period	
Total number of crediting years in the first crediting period (year)	7
Annual average over the 7-year crediting period	120,208

Note: * Not using calendar years, but 12-monthly periods from the start of the crediting period.

The baseline emissions factor has been fixed for the first 7-year crediting period. In each year the amount of CERs actually generated by the project will vary depending on the metered supplied power of the proposed project.

A.4.5. Public funding of the project activity:

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There is no public funding involved in the Windfarm Project.

SECTION B. Application of a baseline methodology

B.1. Title and reference of the approved baseline methodology applied to the project activity:

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The project participants propose to use the approved baseline methodology ACM0002 (version 06, 19 May 2006) “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”. For more information regarding the methodology, please refer to the link: <http://cdm.unfccc.int/methodologies/approved>.

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

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The approved baseline methodology ACM0002 is applicable to the proposed project activities, because:

- The proposed project involves electricity capacity additions from wind sources; and
- The proposed project does not involve switching from fossil fuels to renewable energy at the site of the project activity; and
- The geographic and system boundaries for the North China Power Grid can be clearly identified and information on the characteristics of the grid is available.

B.2. Description of how the methodology is applied in the context of the project activity:

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The proposed project does not modify or retrofit an existing electricity generation facility. ACM0002 defines that for such project activities the baseline scenario is the following:

Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described below.



The baseline emission factor (EF_y) is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors according to the following three steps defined in ACM0002.

Data for the calculations are based on official national statistics books: China Energy Statistical Yearbook and China Electric Power Yearbook.

Step 1. Calculate the Operating Margin emission factor ($EF_{OM,y}$)

Under ACM0002, four various methods are provided for calculating the Operating Margin, including:

- a) Simple OM;
- b) Simple Adjusted OM;
- c) Dispatch data analysis OM;
- d) Average OM.

Detailed information to carry out a dispatch data analysis is not publicly available; therefore the dispatch data analysis OM is not suitable for the proposed project.

According to ACM0002, the Simple OM method is applicable to the project if the low-cost resources constitute less than 50% of total grid generation in average of the five most recent years. The most recent year with available data in yearbook is 2004, and since generation from all sources (including hydro power) other than thermal plants were less than 2% of total generation in the North China Power Grid from 2000 to 2004 (see Table 2), the Simple OM method is applicable to the proposed project.

Table 2 Power Generation in North China Power Grid from 2000 to 2004

Year	Low-cost/must Run Generation (10^8 kWh)	Total Generation (10^8 kWh)	Percentage	Data and Calculation from:
2000	36.3263	3310.7482	1.10%	China Electric Power Yearbook (2001),Page 667
2001	29.27	3611.19	0.81%	China Electric Power Yearbook (2002),Page 617
2002	36.25	4075.45	0.89%	China Electric Power Yearbook (2003),Page 585
2003	39.79	4616.53	0.86%	China Electric Power Yearbook (2004),Page 709
2004	40.32	5308.04	0.76%	China Electric Power Yearbook (2005),Page 474

The Simple OM can be calculated using either of the two following data vintages for years(s) y:

- (ex-ante) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission, if or,
- the year in which project generation occurs, if $EF_{OM,y}$ is updated based on ex-post monitoring.

Here ex-ante vintage is chosen, and EF_{OM} is fixed during the first crediting period.



The Simple Operating Margin emission factor $EF_{OM,y}$ is defined as the generation-weighted average emissions per electricity unit (tCO₂/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants, based on the latest years for which statistical data is available. In any given year the following equation is used:

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_j GEN_{j,y}}$$

$F_{i,j,y}$ and $COEF_{i,j}$ are the amount and associated CO₂ emission coefficient of the fossil fuel i consumed by relevant power sources j in year y , not including low-operation cost and must run power plants, and including imports to the grid. $GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source j .

The fuel consumption and the total electricity generation of thermal plants connected to the North China Power Grid can be obtained from China Energy Statistical Yearbook and China Electric Power Yearbook. More than 10 types of fuel are used in the power plants in the North China Power Grid; tables with consumption figures for each fuel for each of the three years are presented in Annex 3.

The CO₂ emission coefficient $COEF_i$ for each fuel i is obtained as

$$COEF_i = NCV_i \cdot EF_{CO_2,i} \cdot OXID_i$$

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel i . This value can be obtained from China Energy Statistical Yearbook.

$EF_{CO_2,i}$ is the CO₂ emission factor per unit of energy of the fuel i , and it can be calculated by multiplying the carbon emission factor (carbon content) by 44/12. The carbon emission factor can be obtained from page 1.21 in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

$OXID_i$ is the oxidation factor of the fuel, and it can be obtained from page 1.23 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The 2006 IPCC Guidelines suggest that default oxidation factors are 1.00 for each fuel.

According to ACM0002, if net imports do not exceed 20% of total generation in the project electricity system, the average emission rate of the exporting grid is adopted. Project electricity system of the proposed project is North China Power Grid and the connected electricity system is Northeast Power Grid. In 2004, the electricity imports (4,514,550MWh²) from the Northeast Power Grid to the North China Power Grid were only 0.85% of the total generation (530,804,000MWh³) in the North China Power Grid, furthermore this percentage has not changed significantly from 2002 to 2004, so the average emission rate of Northeast Power Grid is taken as the emission factor of the import electricity.

² China Electric Power Yearbook (2005), Page 491.

³ China Electric Power Yearbook (2005), Page 474.



The Simple OM for North China Power Grid has been calculated ex-ante using a 3-year weighted average, based on the most recent statistics available at the time of PDD submission. This allows the Simple OM to be fixed for the first crediting period.

Based on these data, the simple OM emission factor of North China Power Grid is calculated as 1.080 tCO₂/MWh (Annex 3 for details).

Step 2. Calculate the Build Margin emission factor ($EF_{BM,y}$)

The Build Margin is calculated as the generation-weighted average emission factor (tCO₂/MWh) of a sample of power plants m , as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_m GEN_{m,y}}$$

$F_{i,m,y}$ and $COEF_{i,m}$ are analogous to the variables used for the Simple OM calculation above, for all plant m , including the must-run and low-operating cost plant which were excluded for the OM calculation. The sample group m consists of either the five power plants that have been built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently, and if 20% falls on part capacity of a plant, that plant is fully included in the calculation. Given the size of the North China Power Grid, the most recent 20% of additional units is chosen as this would represent a larger, more representative of annual generation.

ACM0002 allows project participants to choose between two given options for calculating the Build Margin for the project, one is *ex-ante* calculation, and the other is annual *ex-post* updating in the first crediting period. For this project the first option is chosen. The Build Margin Emission Factor therefore is based ex-ante on the most recent information available on plants already built at the time of PDD submission. The EF_{BM} therefore is fixed for the first crediting period.

However, because of the limited information that is publicly available, at present it is impossible to know how much generation of NCPG was from the new-built power plant and it is also impossible to find the exact new-built plants which comprise the 20% of the system generation. Considering this situation, this proposed project uses the EB guidance⁴ to calculate $EF_{BM,y}$, for projects in China:

- Use of capacity additions for estimating the build margin emission factor for grid electricity.
- Use of weights estimated using installed capacity in place of annual electricity generation.

⁴ <http://cdm.unfccc.int/Projects/Deviations> (application of approved methodology AM0005)-DNV on 07 Oct 05. The request for deviation was submitted relating to AM0005 and AMS-I.D, however, the deviation also clearly applies to ACM0002 and the proposed project due to the following:

- AM0005 was valid from 14 April 2004 to 2 March 2006 and after this period, it was replaced by ACM0002.
- The calculation procedure of OM and BM in ACM0002 is the same as described in AM0005.



- Use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin (BM).

The calculation of the Build Margin for the proposed project makes use of aggregated data to identify the 20% most recent capacity additions (sample group). This is identified by direct comparison of the total installed capacity on the North China Power Grid in the most recent year where data is available, in this case 2004, and with historical data from preceding years until the 20% threshold is achieved. It is impossible to determine the exact most recent 20% of capacity additions through the use of annual data, and BM is determined by selecting the year since which the new capacity additions are equal to or greater than the 20%.

The percentage is calculated as follows:

$$m = [(C_{2004} - C_n) / C_{2004}] * 100\%$$

Where:

C_{2004} is the capacity in 2004 (most recent year for which published data are available); and
 C_n is the capacity in the reference year n .

The power plants in North China Power Grid consists of thermal power plants, hydro power plants and other type of power plants, and only the thermal power plants (including the coal, the oil and the gas fired) emit CO₂. But the exact capacity of each fuel type such as the coal, the oil and the gas fired in recent years can not be found in the statistical data available, only capacity of the thermal power plant (the sum of the coal, the oil and the gas fired power plant), the hydro and the other type power plant can be obtained in every recent year book. The only feasible method to calculate BM is to use the capacity of the thermal power, the CO₂ emission factor of the thermal power plant ($EF_{Thermal}$) with the best technology commercially available in China needs to be calculated, and then the following equation can be used:

$$EF_{BM} = [C_{Thermal} / (C_{2004} - C_n)] * EF_{Thermal}$$

Where:

$C_{Thermal}$ is the thermal power plant capacity amongst the sample group with the capacity ($C_{2004} - C_n$); and
 $EF_{Thermal}$ is the CO₂ emissions factors of the thermal power plant with the best available technology, rather than to the average of operating power.

In conclusion, the procedure to be used for calculating the build margin using the most recent additional capacity follows steps below:

- Using the latest statistical data available from China Energy Statistical Yearbook (2005) to calculate the different CO₂ emission percentage of coal, oil and gas fired power plants in the total emission of North China Power Grid in 2004.
- From the result above, it can be found that the emission percentage (99.35%) of the coal fired power plants amongst the thermal power plants are nearly 100%, and that the fuel of thermal power plants is predominantly coal and not oil or gas, so the carbon emission factor (CEF) of the coal and the



standard coal consumption (320g/kWh) reflecting the best thermal power plant technology commercially available in the China are used to calculate the emission factor of thermal power plant (EF_{thermal}).

- Using the latest statistical data available (from the China Electric Power Yearbook) determine one year from which the added generation capacity is equal to or just exceeds 20% of the capacity of the latest statistic year 2004. Regarding the added generation capacity above 20%, calculate the Build Margin through multiply the emission factor of thermal power (EF_{thermal}) by the capacity percentage of the thermal power among the about 20% new capacity of 2004:

$$EF_{\text{BM}} = [C_{\text{Thermal}} / (C_{2004} - C_n)] * EF_{\text{Thermal}}$$

To be more conservative, the result (0.882 tCO₂/MWh) is discounted to be the final EF_{BM} by multiplying a coefficient, i.e., the coal fired power plant emission percentage (99.35%).

And the BM emission factor of North China Power Grid is 0.876 tCO₂/MWh (see Annex 3 for more details).

Step 3. Calculate the baseline emission factor (EF_y)

The baseline emissions factor (EF_y) is calculated as the weighted average of the Operating Margin emission factor and Build Margin emission factors following ACM0002. For wind projects, the default weights are as follows: $w_{\text{OM}} = 0.75$ and $w_{\text{BM}} = 0.25$:

$$\begin{aligned} EF_y &= w_{\text{OM}} \cdot EF_{\text{OM},y} + w_{\text{BM}} \cdot EF_{\text{BM},y} \\ &= 0.75 \cdot 1.080 + 0.25 \cdot 0.876 = 1.029 \text{ tCO}_2/\text{MWh} \end{aligned}$$

Using Operating Margin and Build Margin emission factors that are fixed for the duration of the first crediting period, the baseline emissions factor is also fixed for the first crediting period. These parameters will be recalculated at any renewal of the crediting period using the same steps 1-3 in the baseline methodology and the latest data available at that time.

Baseline emissions (BE_y) now can be calculated as the baseline emissions factor (EF_y) multiplied by the annual net generation of the Proposed Project (EG_y):

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity:

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Approved methodology ACM0002 prescribes the use of the latest version of the ‘Tool for the demonstration and assessment of additionality’ agreed by the Executive Board; version 02 is adopted here. The Tool consists of 6 steps as described below.

Step 0. Preliminary screening based on the starting date of the project activity

The starting date of the proposed project does not fall between January 1st 2000 and the date of the registration of the first CDM project activity in the world. Therefore, its crediting period will not start before the registration of the project activity.



Aiming to obtain the additional funding to secure the project financially, since February 2005, the developer of the Windfarm Project contacted and negotiated with the CDM consulting company and finally signed the Carbon Asset Development Agreement with IT Power Ltd (shareholder of Carbon Resource Management) on Dec 5, 2005 to develop CDM business, and then the Windfarm Project construction started in Dec 2005.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Realistic and credible alternatives to the project activity that can be part of the baseline scenario are defined through the following sub-steps:

Sub-step 1a. Define alternatives to the project activity:

The demonstration about the alternative that provides outputs or services comparable with the proposed CDM project activity is as follows:

a) *The thermal power plant with the comparable capacity or electricity power generation;*
If taking the capacity with the same annual generation, according to the current laws and regulations, it is not realistic alternative (please refer to the analysis in sub-step 1b).

b) *Comparable capacity or electricity generation addition provided by North China Power Grid;*

To satisfy the increase of the electricity demand, the power grid company can increase the output generation from operating units and rely on some new built power plants connected to the grid, therefore comparable capacity or electricity generation addition provided by North China Power Grid can be taken as a realistic alternative for the project activity.

c) *The hydro and other kinds of renewable energy power plant with the comparable capacity or electricity power generation;*

Besides wind energy, other kinds of energy like solar PV, geothermal, biomass and hydro are the possible grid-connected renewable energy technologies that could be applied in China. Due to the technology development status and the high cost for power generation, solar PV, geothermal and biomass of the similar installed capacity as the proposed project are alternatives far from being attractive investment in the grid in China. Only hydropower projects have the investment return rate that can compete over that of wind power projects in China. But the utilization hours, the operation period and characteristics of the hydro power are different from those of the proposed project, and the hydro power plants are not able to provide the comparable output or services. Therefore the hydro and other kinds of renewable energy power plant are also not realistic alternative.

d) *The proposed project activity not undertaken as a CDM project activity.*

The proposed project will face many barriers, as demonstrated below, and the proposed project activity not undertaken as a CDM project activity is not a realistic alternative.

***Sub-step 1b. Enforcement of applicable laws and regulations:***

For the alternative a) described in sub-step 1a, if taking the capacity that can generate the same annual power generation and estimating annual utilization hours as 5991 which is the average utilization hours of the thermal units in China in 2004⁵, the alternative baseline scenario for the proposed project should be a grid-connected fossil fuel fired power plant with installed capacity of 19.5MW. However, according to Chinese regulations, thermal power plants of less than 135MW are prohibited for construction in the areas covered by the large grids such as provincial grids⁶. Meanwhile, National Development and Reform Committee (NDRC) requested to execute strictly the policy to close fossil fuel fired power plants less than 50MW. Therefore, alternative b described in sub-step 1a conflicts with Chinese regulations. In this sense, alternative b cannot be a realistic alternative.

To conclude from the sub-step 1a and 1b, comparable capacity or electricity generation addition provided by North China Power Grid is the realistic alternative consistent with current laws and regulations.

Step 2. Investment analysis

The purpose of this step is to determine whether the proposed project activity is the economically or financially less attractive than other alternatives without the revenue from the sale of certified emission reductions (CERs). To conduct the investment analysis, use the following sub-steps:

Sub-step 2a. Determine appropriate analysis method

Determine whether to apply the simple cost analysis, investment comparison analysis or benchmark analysis:

The proposed project activity generates financial benefits by the sales of electricity, so the simple cost analysis (Option I) should not be applied. The investment comparison analysis (Option II) is suitable for a CDM project which has a similar type alternative project. The alternative of the proposed project is comparable capacity or electricity generation addition provided by North China Power Grid, not a concrete project, so Option II is not suitable, either.

Therefore, the benchmark analysis (Option III) is adopted.

Sub-step 2b – Option III. Apply benchmark analysis

Identify the relevant benchmark value which represents standard returns in the market, and compare the financial indicators of the proposed CDM project with the benchmark value.

According to the Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects issued by former State Power Corporation of China in 2002, the benchmark of total investment financial internal rate of return (IRR) of electric power industry is 8%, and only if the total investment IRR of the

⁵ China Electric Power Yearbook (2005), Page 472.

⁶ Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with the Capacity of 135MW or below issued by the General Office of the State Council, decree No. 2002-6.



project is higher than or equivalent to this benchmark, the proposed project is financially feasible. 8% therefore is adopted as the benchmark IRR.

Sub-step 2c. Calculation and comparison of financial indicators:

The investment estimation in the Feasibility Study Report is based on the national regulation and the material and equipment price level of 2004, and the relevant data is listed in table 3:

Table 3 Relevant indicators for financial assessment

Item	Value
Supplied power to the grid	116,820 MWh
Total investment	468.66 million RMB Yuan
Expected operational lifetime	21 Years
Annual cost	23 million RMB Yuan
Debt ratio	65%
Equity ratio	35%
On-grid tariff (Including VAT)	60 RMB cents/ kWh
Interest rate	6.39%
Loan term	15 years
Value added tax rate	8.5%
Income tax rate	33%
Additional tax rate	10%
Assumed CER price	7.5€/tCO ₂

Table 4 shows the IRR of the project without and with CER revenue. It can be seen that IRR without CER revenue is below the benchmark 8% and with revenue from CDM, the proposed project would be more financially attractive if the expected CER price can be 7.5€/tCO₂.

Table 4 Total investment analysis of the proposed project

IRR	
without CDM	with CDM
7.04%	8.18%

The revenue from the sale of CERs is expected to have a significant impact on the IRR, making it reach the financial benchmarks in this case. Although some uncertainties still exist, investors would gain reasonable financial return at such risk. The internal return rates, being 8.18% for total investments would appear more financially attractive for prospective investor.

Sub-step 2d. Sensitivity analysis

A sensitivity analysis is a more frequently used method for assessing the perceived uncertainties by identifying the potential change ranges of some key elements such as capital investments, costs, prices, etc., and potential impacts of such changes on the economic performance of the proposed project. Then the most critical parameters could be found out for final assessment.



For a windfarm project without CDM funding, the factors that influence the IRR of total investment mainly include:

- (1) Static total investments
- (2) Annual O&M cost
- (3) On-grid tariff

Assuming these three parameters to change within the range between -10% and 10%, the outcomes of IRR sensitivities are presented in the following table and figure.

Table 5 IRR sensitivity analysis for the proposed project

Range Parameter	-10%	-7.50%	-5%	-2.50%	0%	2.50%	5%	7.50%	10%
Static total investments	8.45%	8.08%	7.72%	7.37%	7.04%	6.72%	6.42%	6.12%	5.84%
Annual O&M cost	7.60%	7.46%	7.32%	7.18%	7.04%	6.90%	6.76%	6.61%	6.47%
On-grid tariff	5.18%	5.66%	6.13%	6.59%	7.04%	7.49%	7.93%	8.36%	8.79%

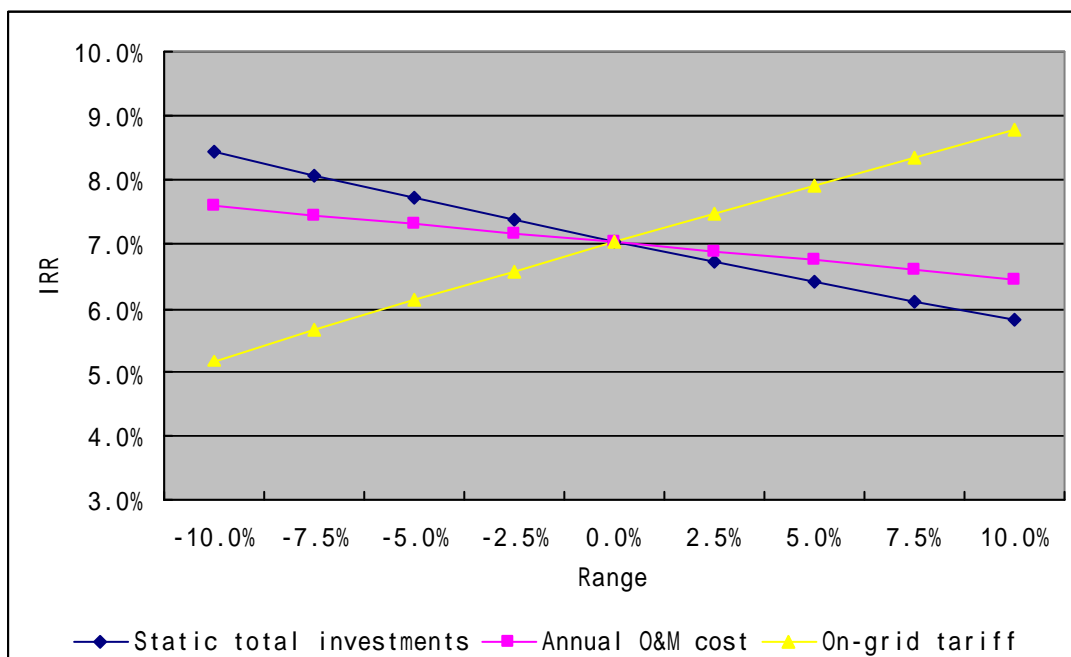


Figure 2 IRR sensitivity analysis for the proposed project

When the three financial indicators above fluctuated within the range of -10% to +10%, the IRR of total investment of the proposed project varies to different extent, as shown in Table 5 and Figure 2. Among them, the impact of the tariff and the static total investment on IRR is more significant. The impact of



annual operational cost on IRR is less significant.

The sensitivity analysis also shows that without CER revenue IRR of the project is unlikely to reach the benchmark 8% unless the investment decreases by about 7.5% or the on-grid tariff increases by about 7.5%, which can hardly happen, because the proposed project has almost built up, and it's hard to decrease the investment so large now and the approved on-grid tariff (0.60Yuan/kWh) is a long-term tariff and it is difficult for the tariff to be increased (refer to the demonstration of the tariff barriers below).

Step 3. Barrier analysis

This analysis shows that the project activity faces barriers that (a) prevent the implementation of this type of proposed project activity; and (b) do not prevent the implementation of the alternatives.

Sub-step 3a. Identify barriers that would prevent the implementation of the project type of the proposed project activity:

Power generation projects using renewable energy technologies face significant barriers in most countries. While the government of China has supported renewable energy sources for more than a decade, the development of wind power projects has not been very fast. Indeed, many of the wind projects in China do not receive satisfactory tariffs and are applying for CDM registration.

Barriers are identified and assessed below.

Investment barriers

International development aid, e.g. from the World Bank, Asian Development Bank, and KfW, as well as government tariff support have been used in China since 1993 to encourage the development of the wind power industry in the country. However, in recent years, the provisions of such soft loans and subsidised government interest rates have gradually decreased, the windfarm developers now have to apply for more commercial loans, furthermore, for a windfarm project only with attractive financial expectation, can the commercial loan be obtained in time successfully.

In China the approximate investment costs of the windfarm is about 8000-10000 RMB Yuan per kW, which is double that of the thermal plant, furthermore the utilization hours of windfarm are about from 2000 to 2500 hours, which is about one third of that of the thermal plant. The total investment cost per kW of the proposed project is more than 9000 RMB Yuan, significantly higher than that of all thermal plants in China.

All these factors above make the financial return rate of the investment and the ability of loan repayment of the proposed project at a lower level. Without the help of CDM, the proposed project would face the difficulty in obtaining the commercial loan.

For the proposed project, additional CDM financing may enable the investment return to be competitive with other projects. Having a full realization of this, the developer of the Windfarm Project started the CDM application process aiming to obtain the additional funding to secure the project financially and institutionally.



Tariff barriers

In the China Renewable Energy Law, which came into force on 1 January 2006, it is encouraged to develop the renewable energy project; however there is no measure that guarantees an on-grid tariff which can attract the windfarm developers.

In the tariff document of Price Bureau of Hebei Province, an on-grid tariff 0.60Yuan /kWh (including VAT) has been approved. Without the support of the fund of the CDM project, the IRR of the proposed project based on this on-grid tariff will be 7.04%, and this is a great barrier to this windfarm project.

Technological barriers

The wind power in China is still on the developing period, so there are many technological barriers as following: skilled and properly trained labor to operate and maintain the technology is not available.

In 2005, the average unit capacity of the new wind turbines installed in mainland of China is 849.70kW⁷. At present stage, the developers in China lack the operating skill in 1500kW wind turbine, and after all, the operating time of 1500kW in China is right over one year. The unit capacity of Shangyi Manjing East is 1500kW, much higher than the average unit capacity above. Furthermore, the wind turbines to be installed in the windfarm are the first group of 1500 kW wind turbine with the localization rate of more than 70%. Without enough related experience, the proposed project will face some technological barriers.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

As demonstrated in Sub-step 1a, comparable capacity or electricity generation addition provided by North China Power Grid is the alternative. The concrete plan can be the increase of the generation output of the existing operating unit or building the new plant.

In fact, it is very common in the power grid to increase the generation output of some operating units to satisfy the load demand, and the thermal capacity installed in Hebei Province in 2004 is 12.62% more than that in 2003⁸. That is to say, either to increase the generation output or to build the new power plant is needed and the practical choice, so there are no barriers that would prevent the implementation of the alternative.

Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity:

Some regions in Hebei Province, such as Chengde and Zhangjiakou region where the proposed project lies have rich wind resources and the similar windfarms in Hebei Province are listed below:

⁷ “Statistics of domestic wind farm installation capacity in 2005”, Shi Pengfei.

⁸ China Electric Power Yearbook (2005), Page 473.

**Table 6 Some similar windfarm projects located in Hebei Province**

Name	Commissioning Date	Capacity (MW)	On-grid Tariff including VAT (RMB/kWh)	Notes
Chengde Hongsong	Dec, 2004	50.1	0.60	Facing financial barriers, applying for carbon financing
Shangyi Damanjing	Sep, 2005	34.5	0.60	Facing financial barriers, applying for carbon financing
Chengde Songshan	Under construction	49.5	0.60 (e)	Facing financial barriers and is applying for CDM
Zhangbei Mijiagou	Under construction	49.5	0.60(e)	Facing financial barriers and is applying for CDM
Guyuan	To be constructed	30.6	0.595(e)	Facing financial barriers and is applying for CDM

Source: "Statistics of domestic wind farm installation capacity in 2005", Shi Pengfei.

Sub-step 4b. Discuss any similar options that are occurring:

It can be shown from the table above that the on-grid tariff of the windfarms in Hebei province is low. Both Hongsong windfarm and Shangyi Damanjing windfarm did not obtained the high on-grid tariff anticipated before the construction period and have to face the serious deficit now. Presently it is not feasible to develop the windfarm in Hebei province even in China without the CERs revenue, and all of the windfarm developers are applying for support of CDM now.

Facing the same difficulties, another windfarm named Zhangbei Manjing Windfarm in Zhangjiakou region has already successfully applied for CDM registration, and it was registered in EB on 23 March 2006⁹.

Step 5. Impact of CDM registration

If the project is officially approved and registered as a CDM activity, the impact of CDM registration will include:

- The realization of the promise of additional income from the sale of certified emission reductions, will improve the developer's loan repaying ability, and give developer's lender more great confidence in the windfarm project development in China.
- The CERs revenue for the proposed project will compensate the tariff gap between the expected price and the financial feasibility price for the project, and it will make the IRR increase to 8.18% at a price of €7.50/tCO₂e. In summary, the additional income improves the financial performance of the project.

⁹ <http://cdm.unfccc.int/Projects/registered.html>, see project with reference number 0233.



- The CERs revenue will help the proposed project improve the ability to hedge risk, and the successful operation of this windfarm will improve the confidence of investor of the proposed project and stimulate the investor to invest more renewable energy power plants.

The CERs revenue is an important supplement to project revenues. The absence of the CERs revenue possibly will make the project face the tariff barriers and lead to cash flow crisis and the failure of the project.

In conclusion, all the steps above are satisfied, the proposed CDM project is not the baseline scenario, and the project activity is additional.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

>>

Emission sources:

For the baseline determination, only CO₂ emissions, from electricity generation by fossil fuel fired power plant that is displaced due to the project activity, are taken into account.

Spatial boundary:

The spatial extent of the project boundary includes the Windfarm Project site and the North China Power Grid that the windfarm is connected to.

As the methodology ACM0002 requests, the delineation of grid boundaries as provided by the DNA of China is used, and the North China Power Grid, including Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia and Shandong Grid¹⁰, is the project electricity system, which is defined by the spatial extent of the power plants that can be dispatched without significant transmission constrains. The electricity transmission between different provinces in the North China Power Grid is very large and it is unreasonable for the proposed project to regard the Provincial Power Grid as the project boundary.

North China Power Grid is connected with Northeast Power Grid, the electricity transfers are from Northeast Power Grid to North China Power Grid.

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

>>

Details of baseline information can be found in Annex 3.

Date of completion of the baseline information: 30/10/2006.

Name of persons determining the baseline:

- Mr. Shi Xiangfeng, Ms. Qian Yiwen, sxf@carbonresource.com. Carbon Resource Management Limited China Representative Office, Suite 1310, Air China Plaza, No 36 Xiaoyun Lu, Chaoyang District, Beijing, China, 100027, Tel: +86 10 844 75246/8.

¹⁰<http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/2006121591135575.pdf>



- Mr. Christiaan Vrolijk, cv@carbonresource.com. Carbon Resource Management Limited, Technology House, 16-18 Whiteladies Road, Bristol, BS8 2LG, UK, Tel: +44 117 980 9442.
- Mr. Ji Deqiang, guohuawe@126.com. Guohua Energy Co., Ltd. No.52 Jiaoda East Road, Haidian District, Beijing, China, 100044, Tel: +86 10 62272612.

Carbon Resource Management Limited is one of the project participants. Guohua Energy Co. Ltd. is the parent company of the other project participant, Guohua (Hebei) Renewable Energy Co., Ltd.

SECTION C. Duration of the project activity / Crediting period**C.1 Duration of the project activity:****C.1.1. Starting date of the project activity:**

>>

01/01/2007

It is estimated that windfarm will be commissioned on 1 Jan 2007.

C.1.2. Expected operational lifetime of the project activity:

>>

21 years.

C.2 Choice of the crediting period and related information:**C.2.1. Renewable crediting period**

7 × 3 years

C.2.1.1. Starting date of the first crediting period:

>>

15/03/2007

C.2.1.2. Length of the first crediting period:

>>

7y-0m

C.2.2. Fixed crediting period:**C.2.2.1. Starting date:**

>>

Not chosen

C.2.2.2. Length:

>>



Not chosen

SECTION D. Application of a monitoring methodology and plan**D.1. Name and reference of approved monitoring methodology applied to the project activity:**

>>

The project participants propose to use the approved consolidated monitoring methodology ACM0002 (version 06) entitled “Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources” , which has to be used in conjunction with the ACM0002 baseline methodology.

D.2. Justification of the choice of the methodology and why it is applicable to the project activity:

>>

This monitoring methodology is to be used in conjunction with the chosen baseline methodology ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”. Application of the approved monitoring methodology ACM0002 to the proposed project is justified because:

- the approved baseline methodology ACM0002 is used;
- the project activity is connected to the grid;
- the electricity is generated using wind sources;
- it is not a fuel switching project; and
- the boundary of the grid to which the Windfarm Project is connected is clearly identifiable as the North China Power Grid and the information on the characteristics of the grid is available.



D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

In accordance with the ACM0002 baseline methodology, the project participants have chosen to use data based on ex-ante monitoring, using the best data available at the time of submission of the PDD.

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:
D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number (Please use numbers to ease cross-referencing to D.3)	Data type	Data variable	Data unit	Measured (m), calculated I or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

The proposed project is a zero-emission electricity generating activity; therefore no emissions from the project activity were identified.

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.)

>>

Project emissions: $PE_y=0$.

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c),	For which baseline method(s) must this	Recording frequency	Proportion of data to be	How will the data be archived? (electronic/ paper)	For how long is archived data kept?	Comment

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				estimated (e),	element be included		monito red			
1. EG _y	Electri city quantit y	Electricity supplied to the grid by the project	MWh	m	Simple OM, BM	Continuou sly measur ement and monthly recording	100%	Electronic	During the crediting period and two years after	Electricity supplied by the project activity to the grid. Double check by receipt of sales.

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.)

>>

The Baseline Emissions (BE_y , in t CO₂), for each year y , are calculated by multiplying the baseline emissions factor (EF_y , in tCO₂/MWh) by the annual generation of the project (EG_y , in MWh), as follows:

$$BE_y = EG_y \cdot EF_y$$

With the baseline emissions factor (EF_y) calculated using operating and build margins as described in detail in section B.2 and following ACM0002 with the following formulae:

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y}$$



$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_j GEN_{j,y}}$$

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i$$

$$EF_{BM} = [C_{Thermal} / (C_{2004} - C_n)] * EF_{Thermal}$$

The weight for operating and build margin emission factors by default is: $w_{OM} = 0.75$, $w_{BM} = 0.25$. The operating margin is calculated using the weighted average of generation in most recent data-obtainable three years in North China Power Grid. The build margin is calculated from publicly available statistics using more than 20% most recently added capacity following the procedure as explained in section B.2.

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number	Data type	Data variable	Data unit	Measured (m), calculated I, estimated (e),	For which baseline method must this element be included	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment

Not applicable.

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.):

>>

Not applicable.

**D.2.3. Treatment of leakage in the monitoring plan****D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity**

ID number (Please use numbers to ease cross-referencing to table D.3)	Data variable	Source of data	Data unit	Measured (m), calculated I or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment

According to ACM0002, no leakage needs to be considered.

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.)

>>

Not applicable as no sources of leakage have been identified.

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.)

>>

The project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plants by renewable electricity. The emission reductions ER_y by the project activity during a given year y is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y), as follows:

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$$ER_y = BE_y - PE_y - L_y$$

With PE_y and L_y being zero as indicated estimated emission reductions can be calculated using the formula for calculating the baseline emissions (BE_y). The Baseline Emissions are calculated by multiplying the baseline emissions factor (EF_y) by the annual net generation of the project (EG_y), as follows:

$$ER_y = BE_y = EG_y \cdot EF_y$$

With the baseline emissions factor (EF_y) calculated using operating and build margins as described in detail in section B.2.

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored		
Data (Indicate table and ID number e.g. 3.-1.; 3.2.)	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
D.2.1.3.-1.	Low	These data will be directly used for calculation of emission reductions. The data are double-checked against commercial data. The meter for monitoring and validation will be used for electricity sales to the grid.

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

>>

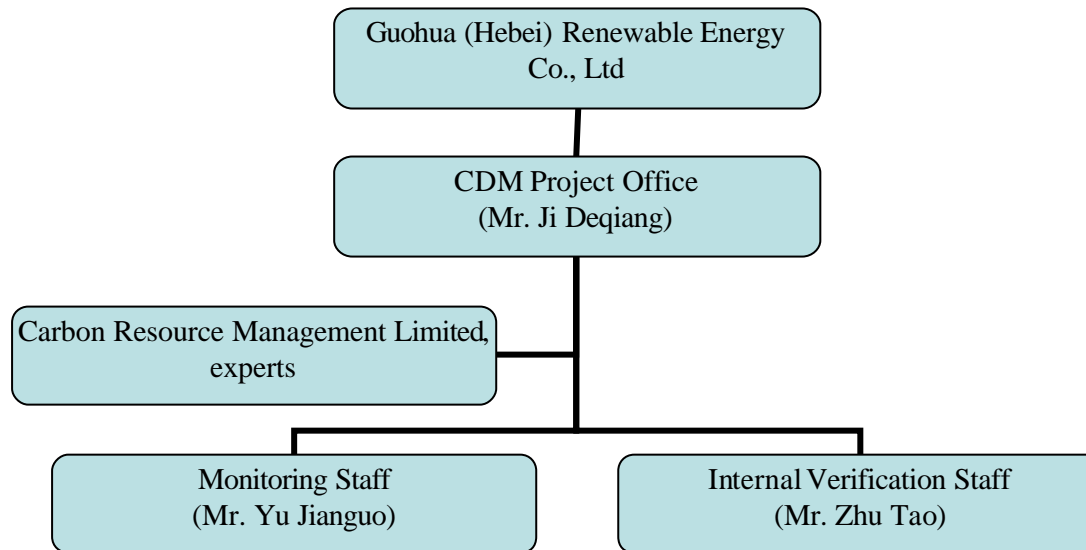
Overall responsibility for monitoring and carrying out the monitoring following this monitoring plan lies with Guohua (Hebei) Renewable Energy Co., Ltd.

Guohua (Hebei) Renewable Energy Co., Ltd. will establish CDM project management office and assign dedicated people responsible for the monitoring and report due to the project activity.

The output from Shangyi Manjing East Project is monitored and recorded using two meters. These meters are used for both CDM purposes and sales of the electricity generated to the grid company.

The CDM management structure is as the following chart:

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The monitoring plan is presented in Annex 4.

D.5 Name of person/entity determining the monitoring methodology:

>>

Date of completion of the monitoring methodology: 30/08/2006.

- Mr. Shi Xiangfeng, Ms. Qian Yiwen, sxf@carbonresource.com. Carbon Resource Management Limited China Representative Office, Suite 1310, Air China Plaza, No 36 Xiaoyun Lu, Chaoyang District, Beijing, China, 100027, Tel: +86 10 844 75246/8.
- Mr. Christiaan Vrolijk, cv@carbonresource.com. Carbon Resource Management Limited, Technology House, 16-18 Whiteladies Road, Bristol, BS8 2LG, UK, Tel: +44 117 980 9442.
- Mr. Ji Deqiang, guohuawe@126.com. Guohua Energy Co., Ltd. No.52 Jiaoda East Road, Haidian District, Beijing, China, 100044, Tel: +86 10 62272612.

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**SECTION E. Estimation of GHG emissions by sources****E.1. Estimate of GHG emissions by sources:**

>>

Project emissions are zero, as this is a wind power project.

E.2. Estimated leakage:

>>

No leakage is identified and no data will be collected, as this is a wind power project.

E.3. The sum of E.1 and E.2 representing the project activity emissions:

>>

Both project emissions (PE_y) and leakage emissions (L_y) are zero, therefore total emissions from the project activity are zero.

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

>>

The Baseline Emissions (BE_y , in t CO₂), for each year y , are calculated by multiplying the baseline emissions factor (EF_y , in tCO₂/MWh) by the net generation of the project (EG_y , in MWh), as follows:

$$BE_y = EG_y \cdot EF_y$$

With the baseline emissions factor (EF_y) calculated using operating and build margins as described in detail in section B.2.

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} = 1.029 \text{ tCO}_2/\text{MWh}$$

It is estimated that windfarm will be commissioned on 1 Jan 2007 and fully operational when this project is registered on 15 March 2007. The supplied power of the proposed project in every full crediting year from 2007 to 2014 is 116,820MWh, so

$$BE = EG \cdot EF = 116,820 \times 1.029 = 120,208 \text{ tCO}_2.$$

The total estimated emission reductions from the project during the first 7-year crediting period are:

$$120,208 \times 7 = 841,456 \text{ tCO}_2$$

These values obtained are presented in the table in section E.6.

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

>>

With E.3 being zero, the emission reductions (ER) from the project activity are given by the baseline emissions given in section E.4.

**E.6. Table providing values obtained when applying formulae above:**

>>

Table 7 Values obtained when applying formulae above

Period*	Estimation of Project activity Emission (tCO ₂ e)	Estimation of baseline emission (tCO ₂ e)	Estimation of leakage (tCO ₂ e)	Estimation of Emission reductions (tCO ₂ e)
2007	0	120,208	0	120,208
2008	0	120,208	0	120,208
2009	0	120,208	0	120,208
2010	0	120,208	0	120,208
2011	0	120,208	0	120,208
2012	0	120,208	0	120,208
2013	0	120,208	0	120,208
Total (tCO₂e)	0	841,456	0	841,456

Note: * Using 12-monthly periods from the start of the crediting period, not calendar years.

SECTION F. Environmental impacts**F.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:**

>>

Environmental Impact Assessment (EIA) for the Windfarm has been completed by Hebei Province Engineering Consulting Institute assigned by the Project owner, and has been approved by the Environmental Protection Bureau of Hebei Province. Here is a summary of the EIA.

1 The analysis of the environment impact in the construction period

The main environmental impacts during the construction period are dust, noise, and solid waste:

- When the speed of the local wind is 2.5m/s, the dust concentration within the 50m region around the construction centre doubles the natural level, with the increase of the wind speed, the impact region of the dust will also be large, however, since the local residential area is 500m away from the windfarm site and local atmosphere environment capacity is very large, the impact of construction dust to the local region is light.
- All the construction work is carried out during day time. The noise level of all kinds of equipments is from 70dB to 110dB. This is within the acceptable levels for the distance to the nearest habitation.
- The solid wastes in the construction period include the waste soil and stone and construction wastes and a little household garbage, and it is required that the wastes should be collected and disposed properly and someone should be designated to be in charge of this work.

2 The analysis of the environment impact in operation period



- The operating noise level of such 1500kW turbine is from 96dB to 104dB, no essential impacts are caused in the range of 500 meters outside as noise has been greatly weakened, and it drops down to the national standard 45dB. Furthermore the resident regions are 500m away from the windfarm, so the noise does not influence the residential districts nearest to the site.
- There are no wastes generated by the wind turbines and the growth of the local plant will not be impacted. The distance between turbines is far and the operation of the windfarm will not impact the natural growth of the local animals.

3. Conclusion

The windfarm both provides some electricity and adds a new tourism sight, and meanwhile it does not put the pressure on the environment. To summarize, the windfarm has the environmental benefit as well as the social benefit.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

Environmental impacts are not considered significant.

SECTION G. Stakeholders' comments

>>

G.1. Brief description how comments by local stakeholders have been invited and compiled:

>>

In January 2006, there were consultations carried out by staff from Guohua (Hebei) Renewable Energy Co., Ltd. with the local community and the local government, which represents the local community. The consultations resulted in a clear support letter for the Project from the local government – see G.2 below.

And in March 2006, staff from Guohua (Hebei) Renewable Energy Co., Ltd. carried out a survey of the local villagers and residents in the area with questionnaire, the result of the survey indicated the support to the project. A summary of the survey—see G.2.

G.2. Summary of the comments received:

>>

Following is a translation of the letter received from the local government.

Comments from Local Government about the Shangyi Manjing East Wind Farm Project

Shangyi Manjing East Windfarm is located in Shangyi County, in the west part of Hebei Province. We believe the construction and operation of the windfarm will promote the development of related industries e.g. tourism and will create jobs for the county. Using local wind resources, the project will contribute to the sustainable development of this underdeveloped region. And as green electricity, this project will be an environment-friendly one. As the local government, we fully support the development of the Shangyi Manjing East Windfarm project.



The People's Government of Shangyi County
16 Jan. 2006
Stamp

Following is a summary of the Local Survey. The survey forms are available from the developer.

A 1 page questionnaire was designed to be easy to fill in and had the following sections:

Project introduction

Respondent's basic information and education level

Questions on:

What is their opinion on their current environment?

Is their environment of living, studying and working quiet?

Will the project have a negative impact on the environment, such as air, noise and water?

Will the project have a negative impact on their livelihood?

Will the project have a positive impact on their livelihood?

What are the concerns they have with respect to the project—air pollution, equipment safety, electromagnetic interference, sight spoiling, noise or daily life waste/ sewage?

Do they agree with the development of the Project?

What environment protection methods should be considered during the Project construction and operation?

What other comments and suggestions do they have for the developer regarding the Project?

The survey had a 70% response rate and the following is a summary of the key findings (The questionnaires were sent to 50 households):

Respondents' basic information and education level

Item	Content	Number	Percentage/%
Gender	Male	20	57%
	Female	15	43%
Age	20 - 30	5	14%
	30 - 40	21	60%
	Above 40	9	26%
Education	Elementary School	20	57%
	Middle School	12	34%
	College	3	9%
Employment	Official	6	17%
	Worker	11	31%
	Farmer	5	14%
	Other	13	37%

Survey Result of Stakeholders

Do you Support this project	Yes	No	Don't care
-----------------------------	-----	----	------------



	100	0	0
What kind of pollution do you mind	sight spoiling	equipment safety	noise
	36%	25%	24%
How do you think the noise in your living area	Quiet	Not noisy	Noisy
	100	0	0
Do you think this project make environment noisy	Yes	No	Not clear
	0	97	3
Do you think this project have a positive impact on the local economy	Yes	No	Not clear
	71	0	29
Do you think this project have a positive impact on the local society	Yes	No	Not clear
	100	0	0

Conclusions from the survey

The survey shows that the Project has strong local support amongst the local people, as further evidenced by the local government support letter. The main issues seem to be sight spoiling, equipment safety, noise. The wind turbine rotation presents the harmonious development of human and nature, and it will not spoil the sight there. The developer will focus on the equipment safety issue not only in the construction period but also in the operation period. The EIA shows that the noise levels would be within China national standards and no interference is expected. However the developer will enforce all measurements to keep a pleasant environment for local people and if any problem occurs, they will find a best way to solved it.

G.3. Report on how due account was taken of any comments received:

>>

The villagers and local government are all supportive of the Project and to date there has been no need to modify the project design according to the comments received.

The project developer has an overall environment-friendly plan to guarantee that the project has the minimum negative impact on the environment during the project construction and operation.

Annex 1**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	Guohua (Hebei) Renewable Energy Co., Ltd.
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FAX:	+86 313 2035529
E-Mail:	guohuanwe@126.com
URL:	
Represented by:	Zhutao
Title:	General Manager
Salutation:	Mr.
Last Name:	Zhu
Middle Name:	
First Name:	Tao
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Title:	Managing Director
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Direct tel:	<u>+44 117 9809441</u>
Personal E-Mail:	nac@carbonresource.com



Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in the Windfarm Project.



ANNEX 3
BASELINE INFORMATION

Step 1. Calculate the Operating Margin emission factor ($EF_{OM, y}$)

Table A1 Calculation of CO₂ Emission of North China Power Grid in 2002

Fuel types	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Fuel consumption in North China Power Grid	Carbon Emission factor (tc/TJ)	Oxidation rate (%)	Average low caloric value (MJ/t,m3,tce)	CO2 emission (tCO ₂ e)
								A	B	C	D	E = A*B*C*D*44/ 12/100
Raw coal	Mtons	6.9184	10.5274	49.8801	40.3739	32.18	51.6286	191.5084	25.8	100	20908	378783852
Cleaned coal	Mtons	0					0.8071	0.8071	25.8	100	26344	2011408
Other washed coal	Mtons	0.0343		0.652	1.3556		1.0632	3.1051	25.8	100	8363	2456568
Coke oven gas	Mm ³	17	171		75	16	4	283	12.1	100	16.726	210008
Other coal gas	Mm ³	1582		734		1035		3351	12.1	100	5.227	777112
Crude oil	Mtons	0					0.1498	0.1498	20	100	41816	459363
Gasoline	Mtons						0.0065	0.0065	18.9	100	43070	19401
Diesel	Mtons	0.0026	0.0235	0.0412		0.016	0.1002	0.1835	20.2	100	42652	579693
Fuel oil	Mtons	0.1394	0.0004	0.0122		0.0042	0.2033	0.3595	21.1	100	41816	1163042
Refinery gas	Mtons			0.0027				0.0027	15.7	100	46055	7158
Natural gas	Mm ³		55			2		57	15.3	100	38.931	124490
Total emission												386592094

Source:

*Fuel consumption and average low caloric value from China Energy Statistical Year Book (2000-2002) P160-P215, P332-335, P536;
The carbon emission factor from page 1.21 in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories;
Oxidation rate from page 1.23 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories.*

**Table A2 Calculation of CO₂ Emission of Northeast Power Grid in 2002**

Fuel types	Unit	Liaoning	Jilin	Heilongjiang	Fuel consumption in Northeast Power Grid	Carbon Emission factor (tc/TJ)	Oxidation rate (%)	Average low caloric value (MJ/t,m3,tce)	CO2 emission (tCO2e)
		A	B	C	$D=A+B+C$	E	F	G	$H=D*E*F*G*44/12/100$
Raw coal	Mtons	32.5852	19.2897	24.2227	76.0976	25.8	100	20908	150513200
Cleaned coal	Mtons	0.0145	0	0.0931	0.1076	25.8	100	26344	268155
Other washed coal	Mtons	3.4755	0.1365	1.404	5.016	25.8	100	8363	3968357
Coke oven gas	Mm ³	189	0	0	189	12.1	100	16.726	140253
Other coal gas	Mm ³	662	0	0	662	12.1	100	5.227	153521
Crude oil	Mtons	0.0863	0	0	0.0863	20	100	41816	264640
Diesel	Mtons	0.006	0.01	0.0011	0.0171	20.2	100	42652	54020
Fuel oil	Mtons	0.2547	0.0175	0.0831	0.3553	21.1	100	41816	1149454
LPG	Mtons	0.0004	0	0	0.0004	17.2	100	50179	1266
Refinery gas	Mtons	0.0699	0	0.0038	0.0737	15.7	100	46055	195396
Natural gas	Mm ³	0	2	256	258	15.3	100	38.931	563480
Total emission									157271740

Source:

Fuel consumption and average low caloric value from China Energy Statistical Year Book (2000-2002) P220-P251, P536; The carbon emission factor from page 1.21 in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Oxidation rate from page 1.23 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

**Table A3 The Power Generation of Northeast Power Grid in 2002**

	Liaoning	Jilin	Heilongjiang	Total
Generation(MWh)	72124000	30934000	46625000	149683000

Source: China Electric Power Yearbook (2003) P585

From China Electric Power Yearbook (2003) Page 591, it can be seen that the self-use rate of the power plants in Northeast Power Grid is 7.67%, so the supplied power to the grid is:

$$149683000 * (1 - 7.67\%) = 138202314 \text{ MWh}$$

$$EF_{2002, \text{ northeast, average}} = 157271740 / 138202314 = 1.137982 \text{ tCO}_2/\text{MWh}$$

Table A4 The Power Generation and Supply of North China Power Grid in 2002

Region	Thermal generation (MWh)	Self-use rate (%)	Supplied Power(MWh)
Beijing	17886000	7.95	16464063
Tianjin	27263000	7.08	25332779.6
Hebei	100970000	6.72	94184816
Shanxi	82256000	7.98	75691971.2
Inner Mongolia	51382000	7.93	47307407.4
Shandong	124162000	6.79	115731400.2
Total			374712437.4

Source: China Electric Power Yearbook (2003) P585, P591

So from Table A1, the CO₂ Emission of North China Power Grid in 2002: EM₂₀₀₂=386592094tons;

The import electricity from Northeast Power Grid to North China Power Grid in 2002:

SUP_{2002, import}=2905280 MWh;

The average emission factor of Northeast Power Grid in 2002:

EF_{2002, northeast, average}=1.137982 tCO₂/MWh;

From Table A4, the supplied Power of thermal plants in North China Power Grid in 2002: SUP₂₀₀₂ = 374712437.4 MWh

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$$\begin{aligned}
 &EF_{OM, \text{ simple, 2002}} \\
 &= (EM_{2002} + EF_{2002, \text{ northeast, average}} \cdot SUP_{2002, \text{ import}}) / (SUP_{2002} + SUP_{2002, \text{ import}}) \\
 &= (386592094 + 1.137982 \times 2905280) / (374712437.4 + 2905280) \\
 &= 1.0325 \text{ tCO}_2/\text{MWh}
 \end{aligned}$$

Import electricity source: <http://www.sp.com.cn/zgdl/spw/12y/wsdljh.htm>

Table A5 Calculation of CO₂ Emission of North China Power Grid in 2003

Fuel types	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Fuel consumption in North China Power Grid	Carbon Emission factor (tc/TJ)	Oxidation rate (%)	Average low caloric value (MJ/t,m3,tce)	CO ₂ emission (tCO ₂ e)
Raw coal	Mtons	7.1473	10.5274	54.8264	45.2851	39.4932	68.08	225.3594	25.8	100	20908	445737636
Cleaned coal	Mtons	0					0.0941	0.0941	25.8	100	26344	234511
Other washed coal	Mtons	0.0631		0.6728	2.0821		4.509	7.327	25.8	100	8363	5796681
Coke	Mtons					0.028		0.028	29.2	100	28435	85244
Coke oven gas	Mm ³	24	171		90	21	2	308	12.1	100	16.726	228560
Other coal gas	Mm ³	1692		1063		1032	156	3943	12.1	100	5.227	914400
Crude oil	Mtons	0					0.2968	0.2968	20	100	41816	910139
Gasoline	Mtons						0.0001	0.0001	18.9	100	43070	298
Diesel	Mtons	0.0029	0.0135	0.04		0.0291	0.054	0.1395	20.2	100	42652	440693
Fuel oil	Mtons	0.1395	0.0002	0.0111		0.0065	0.1007	0.258	21.1	100	41816	834672
LPG	Mtons							0	17.2	100	50179	0
Refinery gas	Mtons			0.0027			0.0083	0.011	15.7	100	46055	29164
Natural gas	Mm ³		50				108	158	15.3	100	38.931	345077
Total Emission												455557075

Source:

Fuel consumption and average low caloric value from China Energy Statistical Year Book (2004) P146-P165 , P202-P205, P302;
The carbon emission factor from page 1.21 in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories;

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Oxidation rate from page 1.23 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Table A6 Calculation of CO₂ Emission of Northeast Power Grid in 2003

Fuel types	Unit	Liaoning	Jilin	Heilongjian g	Fuel consumption in the Northeast Power Grid	Carbon Emission factor (tc/TJ)	Oxidatio n rate (%)	Average low caloric value (MJ/t,m3,tce)	CO2 emission (tCO2e)
		A	B	C	$D=A+B+C$	E	F	G	$H=D*E*F*G*44/12/100$
Raw coal	Mtons	35.5651	20.0666	27.6362	83.2679	25.8	100	20908	164695313
Cleaned coal	Mtons	0.7083	0	0.03	0.7383	25.8	100	26344	1839949
Other washed coal	Mtons	6.1704	0.159	0.5341	6.8635	25.8	100	8363	5429988
Coke oven gas	Mm ³	166	0	0	166	12.1	100	16.726	123185
Other coal gas	Mm ³	531	0	0	531	12.1	100	5.227	123141
Crude oil	Mtons	0.0339	0	0	0.0339	20	100	41816	103955
Diesel	Mtons	0.0032	0.0034	0	0.0066	20.2	100	42652	20850
Fuel oil	Mtons	0.1487	0.007	0.0432	0.1989	21.1	100	41816	643474
LPG	Mtons	0.0155	0		0.0155	17.2	100	50179	49052
Refinery gas	Mtons	0.0403	0	0.0046	0.0449	15.7	100	46055	119040
Natural gas	Mm ³	0	4	447	451	15.3	100	38.931	984997
Total									174132944

Source:

Fuel consumption and average low caloric value from China Energy Statistical Year Book (2004) P166-177, P302; The carbon emission factor from page 1.21 in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Oxidation rate from page 1.23 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Table A7 the Power Generation and Supply of Northeast Power Grid in 2003

Region	Generation (MWh)	Self-use rate (%)	Supplied Power (MWh)
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Liaoning	82336000	7.17	76432508.8
Jilin	33883000	7.32	31402764.4
Heilongjiang	49598000	8.48	45392089.6
Total	165817000		153227362.8

Source: China Electric Power Yearbook (2004) P670, P671

$EF_{2003, \text{northeast, average}} = 174132944/153227362.8 = 1.136435 \text{ tCO}_2/\text{MWh}$

Table A8 the Power Generation and Supply of North China Power Grid in 2003

Region	Thermal generation (MWh)	Self-use rate (%)	Supplied Power (MWh)
Beijing	18608000	7.52*	17208678.4
Tianjin	32191000	6.79*	30005231.1
Hebei	108261000	6.5*	101224035
Shanxi	93962000	7.69*	86736322.2
Inner Mongolia	65106000	7.66*	60118880.4
Shandong	139547000	6.79*	130071758.7
Total			425364905.8

Source: China Electric Power Yearbook (2004) P670, P709

**From China Electric Power Yearbook (2004), only the self-use rate of all the plants including the thermal plants and hydro plants can be found, the self-use rate of the thermal plants is higher than hydro plants, so here adopt the self-use rate of all the plants as the self-use rate of thermal power plants and such method is conservative.*

So from Table A5, the CO₂ Emission of North China Power Grid in 2003: $EM_{2003} = 455557075 \text{ tons}$;

The import electricity from Northeast Power Grid to North China Power Grid in 2003:

$SUP_{2003, \text{import}} = 4244380 \text{ MWh}$;

The average emission factor of Northeast Power Grid in 2003:

$EF_{2003, \text{northeast, average}} = 1.136435 \text{ tCO}_2/\text{MWh}$;

From Table A8, the supplied Power of thermal plants in North China Power Grid in 2003: $SUP_{2003} = 425364905.8 \text{ MWh}$



$$\begin{aligned}
 &EF_{\text{OM, simple, 2003}} \\
 &= (EM_{2003} + EF_{2003, \text{ northeast, average}} \cdot \text{SUP}_{2003, \text{ import}}) / (\text{SUP}_{2003} + \text{SUP}_{2003, \text{ import}}) \\
 &= (455557075 + 1.136435 \times 4244380) / (425364905.8 + 4244380) \\
 &= 1.071626132 \text{ tCO}_2/\text{MWh}
 \end{aligned}$$

Import electricity source: <http://www.sp.com.cn/zgdl/spw/12y/wsdljh.htm>

Table A9 Calculation of CO₂ Emission of North China Power Grid in 2004

Fuel types	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Fuel consumption in North China Power Grid	Carbon Emission factor (tc/TJ)	Oxidation rate (%)	Average low caloric value (MJ/t,m ³ ,tce)	CO ₂ emission (tCO ₂ e)
Raw coal	Mtons	8.2309	14.1	62.998	52.132	49.322	85.5	272.2829	25.8	100	20908	538547477
Cleaned coal	Mtons	0					0.4	0.4	25.8	100	26344	996857
Other washed coal	Mtons	0.0648		1.0104	3.5417		2.8422	7.4591	25.8	100	8363	5901191
Coke	Mtons					0.0022	0	0.0022	29.2	100	28435	6698
Coke oven gas	Mm ³	55	0	54	532	40	873	1554	12.1	100	16.726	1153187
Other coal gas	Mm ³	1774		2425	820	1647	141	6807	12.1	100	5.227	1578574
Diesel	Mtons	0.0039	0.0084	0.0466		0		0.0589	20.2	100	42652	186070
Fuel oil	Mtons	0.1466	0	0.0016		0		0.1482	21.1	100	41816	479451
Refinery gas	Mtons		0.0055	0.0142				0.0197	15.7	100	46055	52229
Natural gas	Mm ³		37		19			56	15.3	100	38.931	122306
Total emission												549024041

Source:

Fuel consumption and average low caloric value from China Energy Statistical Year Book (2005) P202-P221 , P258-P261, P366;
The carbon emission factor from page 1.21 in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories;
Oxidation rate from page 1.23 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

**Table A10 Calculation of CO₂ Emission of Northeast Power Grid in 2004**

Fuel types	Unit	Liaoning	Jilin	Heilong jiang	Fuel consumption in Northeast Power Grid	Carbon Emission factor (tc/TJ)	Oxidation rate (%)	Average low caloric value (MJ/t,m3,tce)	CO ₂ emission (tCO ₂ e)
Raw coal	Mtons	41.442	23.109	30.848	95.399	25.8	100	20908	188689377
Cleaned coal	Mtons	0.8475	0.0109	0.0488	0.9072	25.8	100	26344	2260872
Other washed coal	Mtons	5.7767	0.1426	0.61	6.5293	25.8	100	8363	5165589
Coke	Mtons				0	29.2	100	28435	0
Coke oven gas	Mm ³	483	291		774	12.1	100	16.726	574367
Other coal gas	Mm ³	5733	419		6152	12.1	100	5.227	1426677
Crude oil	Mtons	0			0	20	100	41816	0
Diesel	Mtons	0.0204	0.0116	0.0024	0.0344	20.2	100	42652	108673
Fuel oil	Mtons	0.1281	0.0178	0.0286	0.1745	21.1	100	41816	564536
LPG	Mtons	0.0219			0.0219	17.2	100	50179	69305
Refinery gas	Mtons	0.0979		0.0114	0.1093	15.7	100	46055	289780
Natural gas	Mm ³		3	253	256	15.3	100	38.931	559111
Total emission									199708287

Source:

Fuel consumption and average low caloric value from China Energy Statistical Year Book (2005) P222-P233, P366;
The carbon emission factor from page 1.21 in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories;
Oxidation rate from page 1.23 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Table A11 the Power Generation and Supply of Northeast Power Grid in 2004

Region	Generation (MWh)	Self-use rate (%)	Supplied Power (MWh)
Liaoning	88754000	6.94	82594472.4
Jilin	39470000	6.64	36849192
Heilongjiang	54866000	7.69	50646804.6
Total	183090000		170090469

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Source: China Electric Power Yearbook (2005) P472, P474

$$EF_{2004, \text{ northeast, average}} = 199708287/170090469 = 1.174130 \text{ tCO}_2/\text{MWh}$$

Table A12 the Power Generation and Supply of North China Power Grid in 2004

Region	Thermal generation (MWh)	Self-use rate (%)	Supplied Power (MWh)
Beijing	18579000	7.94	17103827.4
Tianjin	33952000	6.35	31796048
Hebei	124970000	6.5	116846950
Shanxi	104926000	7.7	96846698
Inner Mongolia	80427000	7.17	74660384.1
Shandong	163918000	7.32	151919202.4
Total			489173109.9

Source: China Electric Power Yearbook (2005) P472, P474

So from Table A9, the CO₂ Emission of North China Power Grid in 2004: $EM_{2004} = 549024041$ tons;

The import electricity from Northeast Power Grid to North China Power Grid in 2004:

$$SUP_{2004, \text{ import}} = 4,514,550 \text{ MWh};$$

The average emission factor of Northeast Power Grid in 2004:

$$EF_{2004, \text{ northeast, average}} = 1.174130 \text{ tCO}_2/\text{MWh};$$

From Table A12, the supplied Power of thermal plants in North China Power Grid in 2004: $SUP_{2004} = 489173109.9 \text{ MWh}$

$$EF_{\text{OM, simple, 2004}}$$

$$= (EM_{2004} + EF_{2004, \text{ northeast, average}} \cdot SUP_{2004, \text{ import}}) / (SUP_{2004} + SUP_{2004, \text{ import}})$$

$$= (549024041 + 1.174130 \times 4514550) / (489173109.9 + 4514550)$$

$$= 1.12282472 \text{ t CO}_2/\text{MWh}$$

Import electricity source: China Electric Power Yearbook (2005) P491

**Table A13 the OM and Emission of 2002-2004**

Year	Total Emission (tCO ₂)	Total Supplied Power (MWh)	OM _{year} (tCO ₂ /MWh)	EF _{OM} (tCO ₂ /MWh)
2002	389898251	377617717.4	1.032521072	
2003	460380537	429609285.8	1.071626132	
2004	554324709	493687659.9	1.12282472	
Total	1404603496	1300914663		1.080

$$EF_{OM} = EF_{OM, \text{ simple, average}} = 1404603496 / 1300914663 = 1.080 \text{ tCO}_2/\text{MWh}$$

Step 2. Calculate the Build Margin emission factor ($EF_{BM, y}$)*Sub-step 1:*

Using the latest statistical data available from China Energy Statistical Yearbook (2005) to calculate the different CO₂ emission percentage of coal, oil and gas fired in the total emission of North China Power Grid in 2004.

Table A14 Calculation of CO₂ Emission of North China Power Grid in 2004

Fuel types	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Fuel consumption in North China Power Grid	Carbon Emission factor (tc/TJ)	Oxidatio n rate (%)	Average low caloric value (MJ/t,m3,tce)	CO2 emission (tCO ₂ e)
Raw coal	Mtons	8.2309	14.1	62.998	52.132	49.322	85.5	272.2829	25.8	100	20908	538547477
Cleaned coal	Mtons	0					0.4	0.4	25.8	100	26344	996857
Other washed coal	Mtons	0.0648		1.0104	3.5417		2.8422	7.4591	25.8	100	8363	5901191
Coke	Mtons					0.0022	0	0.0022	29.2	100	28435	6698
Total coal emission												545452222
Diesel	Mtons	0.0039	0.0084	0.0466		0		0.0589	20.2	100	42652	186070

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Fuel oil	Mtons	0.1466	0	0.0016	0	0.1482	21.1	100	41816	479451		
Total oil emission									100	665522		
Coke oven gas	Mm3	55	0	54	532	40	873	1554	12.1	100	16.726	1153187
Other coal gas	Mm3	1774		2425	820	1647	141	6807	12.1	100	5.227	1578574
Refinery gas	Mtons		0.0055	0.0142				0.0197	15.7	100	46055	52229
Natural gas	Mm3		37		19			56	15.3	100	38.931	122306
Total gas emission											2906297	
Total emission											549024041	

Source:

Fuel consumption and average low caloric value from China Energy Statistical Year Book (2005) P202-P221 , P258-P261, P366,; The carbon emission factor from page 1.21 in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Oxidation rate from page 1.23 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

The emission percentage of the coal: $P_{\text{coal}} = 545452222 / 549024041 = 99.35\%$;

The emission percentage of the oil: $P_{\text{oil}} = 665522 / 549024041 = 0.12\%$;

The emission percentage of the gas: $P_{\text{gas}} = 2906297 / 549024041 = 0.53\%$.

Sub-step 2:

CO₂ emission factor of thermal plant is calculated from standard coal consumption of thermal power plant in National Study of China¹¹ Climate Change (published by Tsinghua University Publication House) which gives the coal consumption of thermal power plant trend in 2010 as 320 gce/kwh, According to this national study, the standard coal consumption of thermal power plant in 2000 is 350gce /kWh, and if various measures aimed at improving energy efficiency could be carried out, the value of 350gce /kWh is expected to reduce to 320g/kWh by 2010. From China Electricity Year Book (2005) edition, it can be found that the lowest coal consumption in North China region is 344gce/kWh, therefore the value of 320 gce/kWh both reflects the best available technology (with the lowest carbon emission level) in china and is very conservative for the calculation of BM.

From Sub-step 1, it can be found that in 2004 in North China Power Grid, 99.35% of total emissions were from coal fired power plants, and therefore, based

¹¹ <http://www.ccchina.gov.cn/cn/NewsInfo.asp?NewsId=4141>



on this percentage (nearly 100%), it is acceptable to regard 25.8 tc/TJ (from IPCC 2006) as the carbon emission factor of the thermal power plant with the final discount below the Table A20.

Table A15 Calculation of CO₂ Emission Factor of Thermal Power Plant with the Best Commercial Efficiency in China

Standard coal consumption (gce/kwh)	the net caloric value of standard coal (TJ/ton ce)	the C factor (tc/TJ)	Oxidation rate (%)	CO ₂ emission factor (tCO ₂ /MWh)
A	B	C	D	E=A*B*C*D*44/12/100000
320	0.02927	25.8	100	0.886

Source:

The carbon emission factor from page 1.21 in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Oxidation rate from page 1.23 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

$$EF_{thermal}=0.886 \text{ tCO}_2/\text{MWh}$$

Sub-step3:

Using the latest statistical data available (from the China Electric Power Yearbook) determine the year from which the added generation capacity is equal to or just exceeds 20% of the latest statistic year 2004.

Table A16 Installed Capacity of North China Power Grid in 2004

	Total Capacity (MW)	Hydro Capacity (MW)	Thermal Capacity (MW)	Others (MW)
Beijing	4514.4	1055.9	3458.5	0
Tianjin	6013.5	5	6008.5	0
Hebei	20730	783.8	19932.7	13.5
Shanxi	18480.5	787.3	17693.3	0
Inner Mongolia	14321.2	567.9	13641.5	111.7
Shandong	32923.6	50.8	32860.4	12.3
total	96983.2	3250.7	93594.9	137.5

Source: China Electric Power Yearbook (2005) P473

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**Table A17 Installed Capacity of North China Power Grid in 2002**

	Total Capacity (MW)	Hydro Capacity (MW)	Thermal Capacity (MW)	Others (MW)
Beijing	4446	1038.5	3407.5	0
Tianjin	6250.5	5	6245.5	0
Hebei	17535.1	775.9	16745.7	13.5
Shanxi	15123.1	795.3	14327.8	0
Inner Mongolia	10447.4	592.1	9778.7	76.6
Shandong	25153.1	50.8	25102.4	0
total	78955.2	3257.6	75607.6	90.1

Source: China Electric Power Yearbook (2003) P584

Table A18 Installed Capacity of North China Power Grid in 2001

	Total Capacity (MW)	Hydro Capacity (MW)	Thermal Capacity (MW)	Others (MW)
Beijing	4470.6	1058.1	3412.5	0
Tianjin	5637	5	5632	0
Hebei	17227.4	742.6	16474.9	9.9
Shanxi	14211.8	795.9	13415.9	0
Inner Mongolia	9511.2	566.2	8898.3	46.7
Shandong	21013.9	56.2	20957.7	0
total	72071.9	3224	68791.3	56.6

Source: China Electric Power Yearbook (2002) P616

Table A19 Added capacity in the North China Power Grid

Year	Installed Capacity (MW)	The amount of capacity less than 2004	Added capacity percentage (% of 2004)	Selected years?
2004	96983.2	–	–	–

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2002	78955.2	18028	18.589%	N
2001	72071.9	24911.3	25.686%	Y

$$m = [(C_{2004} - C_n) / C_{2004}] * 100\% = (96983.2 - 72071.9) / 96983.2 = 25.686\%;$$

$$n = 2001.$$

Table A20 Build margin data for the North China Power Grid (2001-2004)

	Capacity, 2001(MW)	Capacity, 2004(MW)	Added capacity, 2001-2004(MW)	Share (%)	EF _{Thermal} (tCO ₂ /MWh)	Weighted average EF _{BM} (tCO _{2e} / MWh)
Hydro	3224.0	3250.7	26.7	0.10%		0
Thermal	68791.3	93594.9	24803.6	99.58%	0.886	0.882
Other	56.6	137.5	80.9	0.32%		0
Total	72071.9	96983.2	24911.3	100.000%		0.882

Source: China Electric Power Yearbook 2001, 2005.

To be more conservative, the result (0.882) in Table A20 is discounted to be EF_{BM} by multiplying a coefficient, the coal fired power plant emission percentage (99.35%):

$$EF_{BM} = 0.882 * 99.35\% = 0.876 \text{ tCO}_2/\text{MWh}.$$

Step 3. Calculate the baseline emission factor EF_y

$$EF = w_{OM} \cdot EF_{OM} + w_{BM} \cdot EF_{BM} = 0.75 \times 1.080 + 0.25 \times 0.876 = 1.029 \text{ tCO}_2/\text{MWh}$$



Annex 4

MONITORING PLAN

1. Introduction

The Shangyi Manjing East Windfarm Project adopts the Revision to the approved consolidated monitoring methodology ACM0002 “Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources” to determine the emission reductions from the net electricity generation from the windfarm. This plan describes in more detail the process as set out in Section D of the Project Design Document.

2. Responsibility

Overall responsibility for monitoring and carrying out the monitoring following this monitoring plan lies with Guohua (Hebei) Renewable Energy Co., Ltd.

Mr. Yu Jianguo, the Assistant General Manager of Guohua (Hebei) Renewable Energy Co., Ltd, is responsible for the monitoring and reporting of the windfarm. Guohua (Hebei) Renewable Energy Co., Ltd., in co-operation with the North China Power Grid Company, and existing windfarms experienced experts, and with the help of DOE, will train the staff carrying out the monitoring work.

3. Installation of meters

Project net electricity generation will be monitored through the use of on site metering equipment at the substation.

The net electricity generation will base on the main meter installed in Zhangbei substation, and the backup meter in Shangyi Manjing East Windfarm is an assistant one. Both the main metering system equipment and the backup metering system equipment will be owned, operated and maintained by North China Power Grid.

Both meters will have the capability to be read remotely through a communication line. Both North China Power Grid and Shangyi Manjing East Windfarm have the right to read either meter.

4. Calibration

The metering equipment are calibrated and checked annually for accuracy so that the metering equipment shall have sufficient accuracy. The net generation output registered by the meters alone will suffice for the purpose of billing and emission reduction verification as long as the error in the meters is within the agreed limits.

Calibration is carried out by North China Power Grid with the records being supplied to Shangyi Manjing East Windfarm, and these records will be maintained by Shangyi Manjing East Windfarm and the third party appointed by DOE.

Both meters shall be jointly inspected and sealed on behalf of the parties concerned and shall not be interfered with by either party except in the presence of the other party or its accredited representatives.



All the meters installed shall be tested by North China Power Grid within 10 days after: the detection of a difference larger than the allowable error in the readings of both meters; the repair of all or part of meter caused by the failure of one or more parts to operate in accordance with the specifications.

If any errors are detected the party owning the meter shall repair, recalibrate or replace the meter giving the other party sufficient notice to allow a representative to attend during any corrective activity.

Should any previous months reading of the main meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the net generation output shall be determined by (a) first, by reading backup meter, unless a test by either party reveals it is inaccurate; (b) if the backup system is not with acceptable limits of accuracy or operation is performed improperly the Shangyi Manjing East Windfarm and North China Power Grid shall jointly prepare a reasonable and conservative estimate of the correct reading, and provide sufficient evidence that this estimation is reasonable and conservative when DOE undertakes verification; and (c) if North China Power Grid and Shangyi Manjing East Windfarm fail to agree then the matter will be referred for arbitration according to agreed procedures.

5. Monitored data

During the first seven operating years, the on-site net electricity generation (*EG*) will be monitored and recorded following the procedures above. Data variables to be monitored are presented in Section D of the PDD.

6. Quality control

Monthly net generation data will be approved and signed off by General Manager Mr. Zhu Tao before it is accepted and stored.

This audit will check compliance with operational procedures in this monitoring plan and Section D of the PDD.

This internal audit will also identify potential improvements to procedures to improve monitoring and reporting in future years. If such improvements are proposed these will be reported to the DOE and only operationalised after approval from the DOE.

7. Data management system

Physical documents such as paper-based maps, diagrams and environmental assessments will be collated in a central place, together with this monitoring plan. In order to facilitate auditors' reference of relevant literature relating to Shangyi Manjing East Windfarm project, the project material and monitoring results will be indexed. All paper-based information will be stored by the technology department of Shangyi Manjing East Windfarm and all the material will have a copy for backup.

And all data including calibration records is kept until 2 years after the end of the total crediting period of the CDM project.



8. Reporting

The steps required to meet the requirements for emissions reduction monitoring include:

- Zhangjiakou Electric Power Company reads main meter and reports the result to North China Power Grid Company monthly.
- Zhangjiakou Electric Power Company supplies reading to Shangyi Manjing East Windfarm monthly.
- Shangyi Manjing East Windfarm records readings from the backup meter monthly.
- Shangyi Manjing East Windfarm carries out an internal audit on and reports the readings to the DOE 10 days before the verification is requested.

9. Verification

Guohua (Hebei) Renewable Energy Co., Ltd. will facilitate the verification through providing the DOE with all required necessary information at any stage.